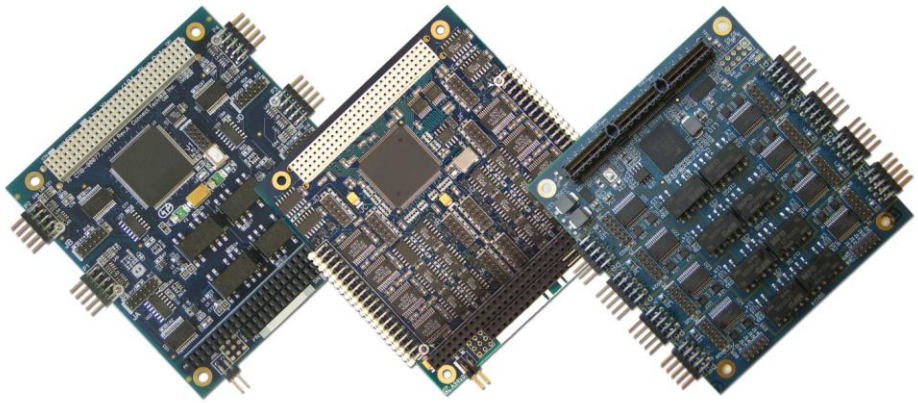
Connect Tech Inc.
Industrial Strength Communications

Xtreme/104 *Plus*, PCI-104 and PCI/104 Express Family User Manual



Connect Tech Inc.
42 Arrow Road
Guelph, Ontario
N1K 1S6

Tel: 519-836-1291
Toll: 800-426-8979 (North America only)
Fax: 519-836-4878
Email: sales@connecttech.com
support@connecttech.com
Web: www.connecttech.com

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Connect Tech Inc. provides a lifetime warranty for all of our products. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at our option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non Connect Tech Inc. authorized modification or repair.

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Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech Inc. reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Our support section is available 24 hours a day, 7 days a week on our website at: www.connecttech.com/sub/support/support.asp. See the contact information section below for more information on how to contact us directly. Our technical support is always free.

Contact Information

We offer three ways for you to contact us:

Mail/Courier

You may contact us by letter at:

Connect Tech Inc.
Technical Support
42 Arrow Road, Guelph, ON
Canada N1K 1S6

Email/Internet

You may contact us through the Internet. Our email and URL addresses on the Internet are:
sales@connecttech.com
support@connecttech.com
www.connecttech.com

Note:
Please go to the **Download Zone** or the **Knowledge Database** in the **Support Center** on the Connect Tech Inc. website for product manuals, installation guides, device driver software and technical tips.
Submit your technical support questions to our customer support engineers via the **Support Center** on the Connect Tech Inc. website.

Telephone/Facsimile

Technical Support representatives are ready to answer your call Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time. Our numbers for calls are:

Telephone: 800-426-8979 (North America only)
Telephone: 519-836-1291 (Live assistance available 8:30 a.m. to 5:00 p.m. EST, Monday to Friday)
Facsimile: 519-836-4878 (online 24 hours)

Conventions used in this manual

This manual uses the following conventions:

- When referring to the entire family of products Xtreme/104 *Plus*, Xtreme/PCI-104, Xtreme/104 Express and Xtreme/104 *Plus* Opto are abbreviated to **Xtreme/104.**
- Special or important tips are formatted with a **Green Background.**

Introduction

Connect Tech's Xtreme/104-***Plus***, 104-PCI and 104/Express family combines the best of the Universal PCI bus with the rugged and compact form factor of PC/104.

The various models are PCI 2.0, PC/104-***Plus*** 2.0 or PCIe/104 compliant. The modular Xtreme/104-***Plus*** and Xtreme/104-***Plus*** Opto cards include a PC/104 pass-through connector option for compatibility with legacy PC/104 cards.

The Xtreme/104 family offer independent port configuration for baud rate, and data bit options of 5, 6, 7 and 8, as well as, 1, 1.5 and 2 stop bits. Select between odd and even parity. The Xtreme/104 Express offers a fractional baud rate generator which allows almost any baud rate to be selected as well as a 9 bit addressing mode.

Connect Tech's Xtreme/104-***Plus and Express*** cards are perfect for embedded applications such as, industrial PCs, kiosks, military systems, aerospace, medical systems, POS devices and any system requiring fast data transfer speeds and a rugged, compact form factor. These self-stacking cards are low on power consumption and function in industrial temperature conditions.

Features

Xtreme/104-Plus

- Universal PC/104-***Plus*** adapter
- PCI 2.0 and PC/104-***Plus*** compliant
- 2 port model: 2 ports RS-423
- 4 port models: 4 ports RS-423 or 4 ports jumper selectable RS-232/422/485
- 8 port models: 8 ports jumper selectable RS-232/422/485, TTL model as well
- TTL model has the ability to disable ports when not in use
- Maximum data rates of 115.2 Kbps (RS-423), 921.6 Kbps (RS-232/TTL) and 1.8432 Mbps (RS-422/485)
- Operating temperature range of -40ºC to 85ºC
- Each port can be configured independently for baud rate, parity, data and stop bits
- High performance PCI UARTs
- PC/104 pass-through connectors installed for compatibility with legacy PC/104 cards on select models
- Software support for Windows 2000/XP/Server/Vista/7, QNX 4, QNX6, Linux and VxWorks. Contact sales or support for most recent list and model compatibility.
- Available signals
  - *RS-423 Model:*
    - RS-423: TxD-, TxDRef, RxD+/-, RTS-, RTSRef, CTS+/-
  - *RS-232/422/485 Models:*
    - RS-232: TxD, RxD, RTS, CTS, RI, DTR, DSR, DCD and Signal Ground (SG)
    - RS-422/485: TxD+/-, RxD+/-, RTS+/-, CTS+/- and Signal Return (SR)
  - *RS-232/422/485/TTL Models*:
    - RS-232/TTL: TxD, RxD, RTS, CTS, RI, DTR, DSR, DCD, Signal Ground (SG), +5V
    - RS-422/485: TxD+/-, RxD+/- and Signal Reference (SR)
- Multilayer PCB built with EMI reduction techniques
- Built with low power CMOS components
- PCI plug and play -- no jumpers to set for memory or interrupt configuration

Xtreme/104-Plus Opto

- Universal PC/104-***Plus*** adapter
- PCI 2.0 and PC/104-***Plus*** compliant
- 2 or 4 ports jumper selectable for RS-232/422/485
- Supports full duplex, half duplex and multi-drop communication modes in RS-422/485
- Maximum data rates of 921.6 Kbps (RS-232) and 1.8432 Mbps (RS-422/485)
- Operating temperature range of -40ºC to 85ºC
- Each port can be configured independently for baud rate, parity, data and stop bits
- High performance PCI UARTs
- 3kV DC (2.12kV AC RMS) of optical isolation
- PC/104 pass-through connectors installed for compatibility with legacy PC/104 cards
- Software support for Windows 2000/XP/Server/Vista/7, QNX 4, QNX6, Linux and VxWorks. Contact sales or support for most recent list and model compatibility.
- Available signals
    - RS-232: TxD, RxD, RTS, CTS and Signal Ground (SG)
    - RS-422/485: TxD+/-, RxD+/-, RTS+/-, CTS+/- and Signal Reference (SR)
- Multilayer PCB built with EMI reduction techniques
- Built with low power CMOS components
- PCI plug and play -- no jumpers to set for memory or interrupt configuration

Xtreme/104-Express Opto

- PCIe/104 Version 1.1 compliant.
- 4 or 8 port models with jumper selectable for RS-232/422/485
- Supports full duplex, half duplex and multi-drop communication modes in RS-422/485
- Maximum data rates of 921.6 Kbps (RS-232) and 7.812Mbps +/-1.5% (RS-422/485) with 16x baud clock.
- Fractional Baud rate generator that can generate just about any baud rate with less than 1% error. Common baud rates like 1200, 9600, 19200, 57600, 230400 etc typically have less than 0.1% error.
- 256 byte RX and TX FIFO buffers, improve performance and eliminate lost receive data
- Operating temperature range of -40ºC to 85ºC
- Each port can be configured independently for baud rate, parity, data and stop bits
- High performance PCI-Express four or eight port UART
- 3kV DC (2.12kV AC RMS) optical isolation
- Software support for Windows XP/Vista/7, more support coming soon.
- Available signals
    - RS-232: TxD, RxD, RTS, CTS and Signal Ground (SG)
    - RS-422/485: TxD+/-, RxD+/-, RTS+/-, CTS+/- and Signal Reference (SR)
- Multilayer PCB built with EMI reduction techniques
- Built with low power CMOS components
- PCI plug and play -- no jumpers to set for memory or interrupt configuration

Xtreme/PCI-104 12 Port Opto

- PCI-104 Version 1.0 compliant
- Highest port density isolated serial board on the market!
- 12 ports with jumper selectable for RS-232/422/485
- Supports full duplex, half duplex and multi-drop communication modes in RS-422/485
- Maximum data rates of 921.6 Kbps (RS-232) and 2.06Mbps (RS-422/485) with 16x baud clock.
- Fractional Baud rate generator that can generate just about any baud rate with less than 1% error. Common baud rates like 1200, 9600, 19200, 57600, 230400 etc typically have less than 0.1% error.
- 64 byte RX and TX FIFO buffers, improve performance and eliminate lost receive data
- Operating temperature range of -40ºC to 85ºC
- Each port can be configured independently for baud rate, parity, data and stop bits
- High performance UARTs on each port.
- 1kV AC RMS optical isolation
- Software support for Windows 2000/XP/Server/Vista/7, QNX 4, QNX6, Linux. Contact sales or support for most recent list and model compatibility.
- Available signals
    - RS-232: TxD, RxD, RTS, CTS and Signal Ground (SG)
    - RS-422/485: TxD+/-, RxD+/-, RTS+/-, CTS+/- and Signal Reference (SR)
- Multilayer PCB built with EMI reduction techniques
- Built with low power CMOS components
- Features locking connector on DB9M I/O cable to prevent accidental removal in applications prone to vibration.
- PCI plug and play -- no jumpers to set for memory or interrupt configuration
- Built with low power components. Each port features a low power shutdown mode if port is not used.

Xtreme/104-*Plus* Diagrams

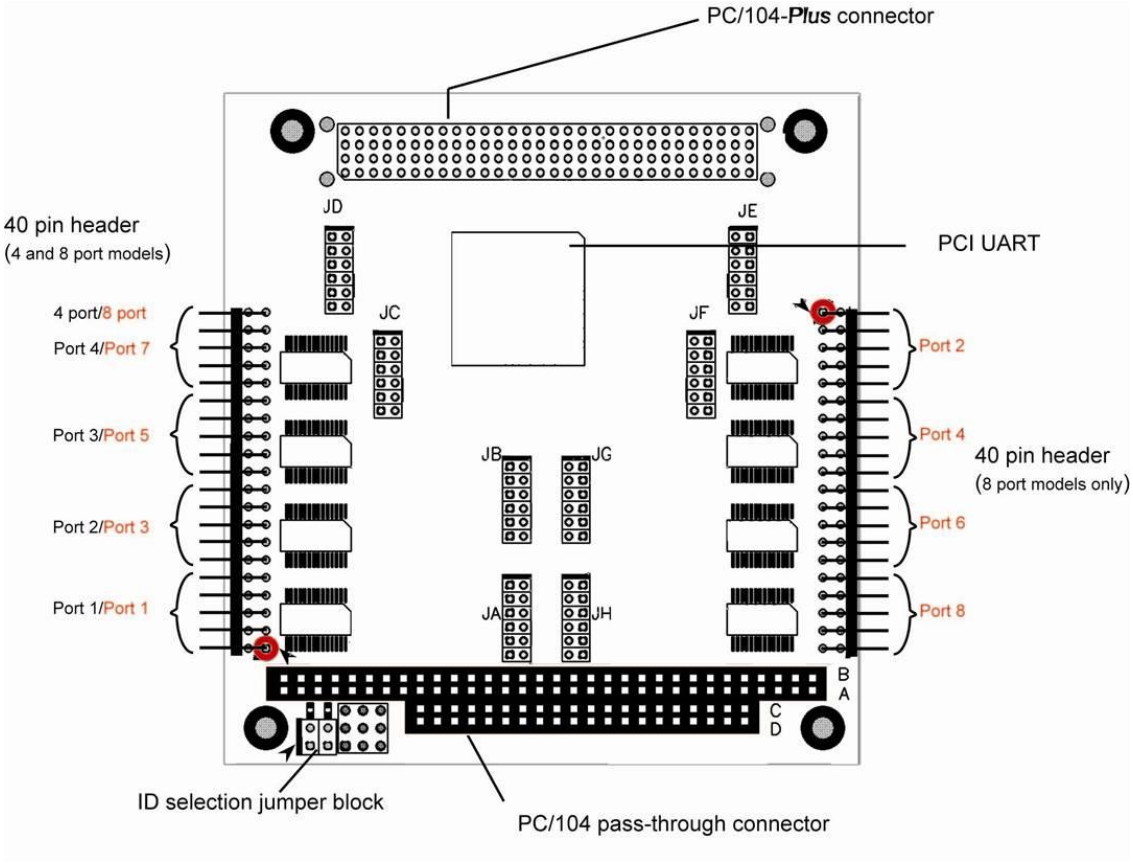


Figure 1: Xtreme/104-Plus RS-232/422/485 Model Hardware Components

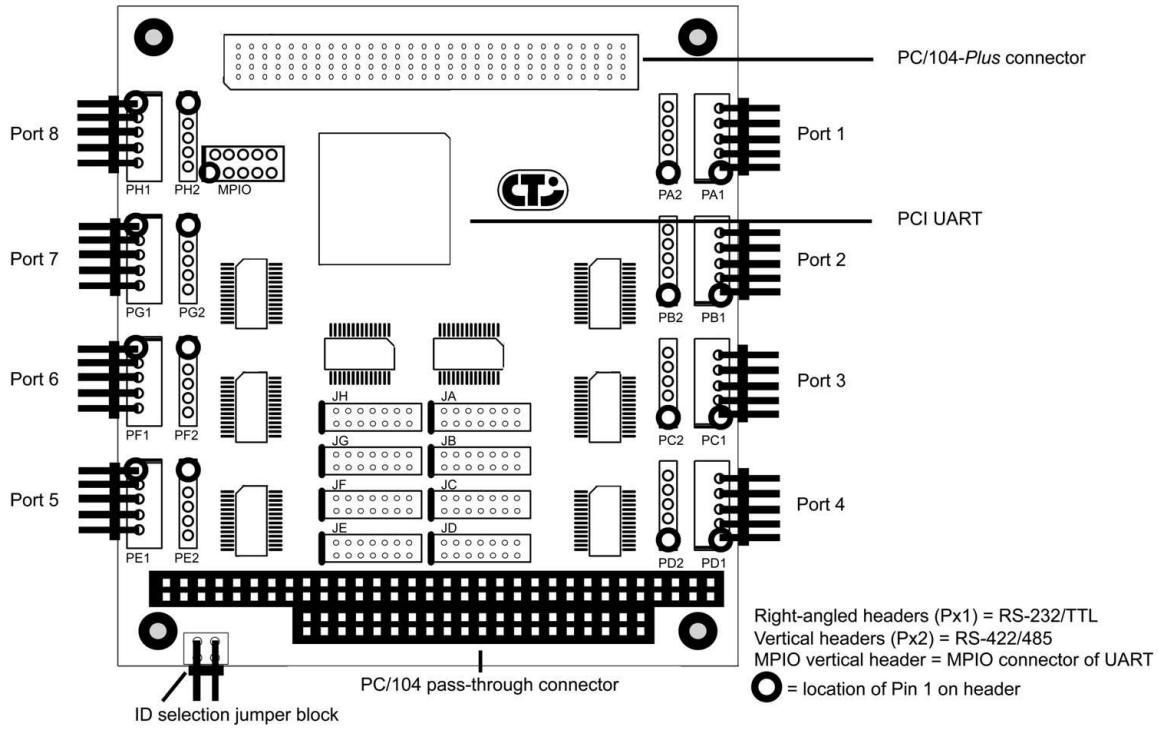


Figure 2: Xtreme/104-Plus RS-423 Model Hardware Components

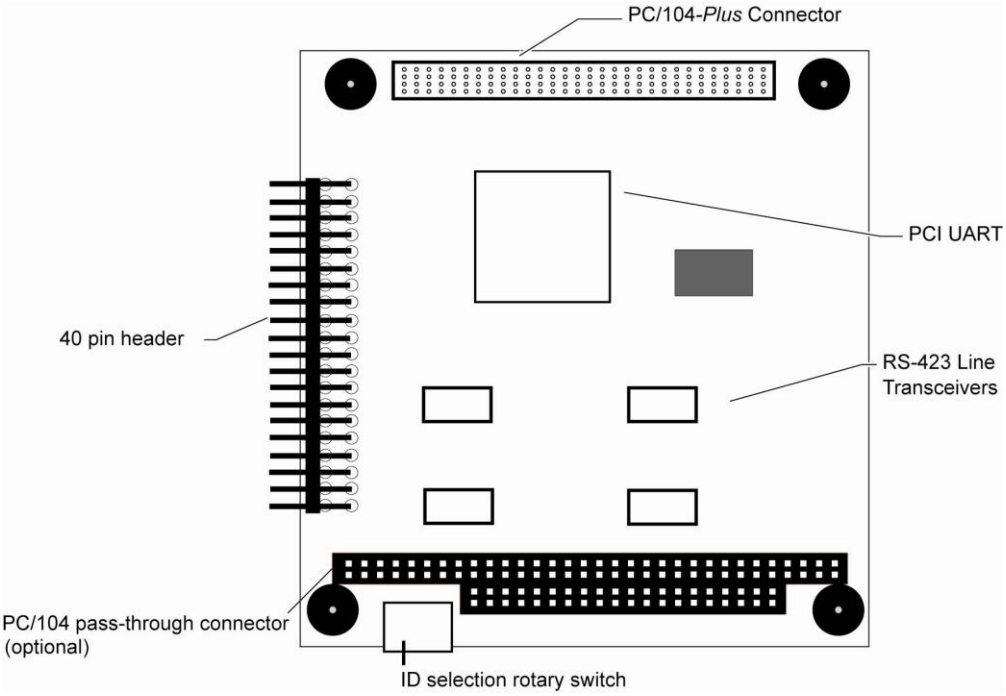
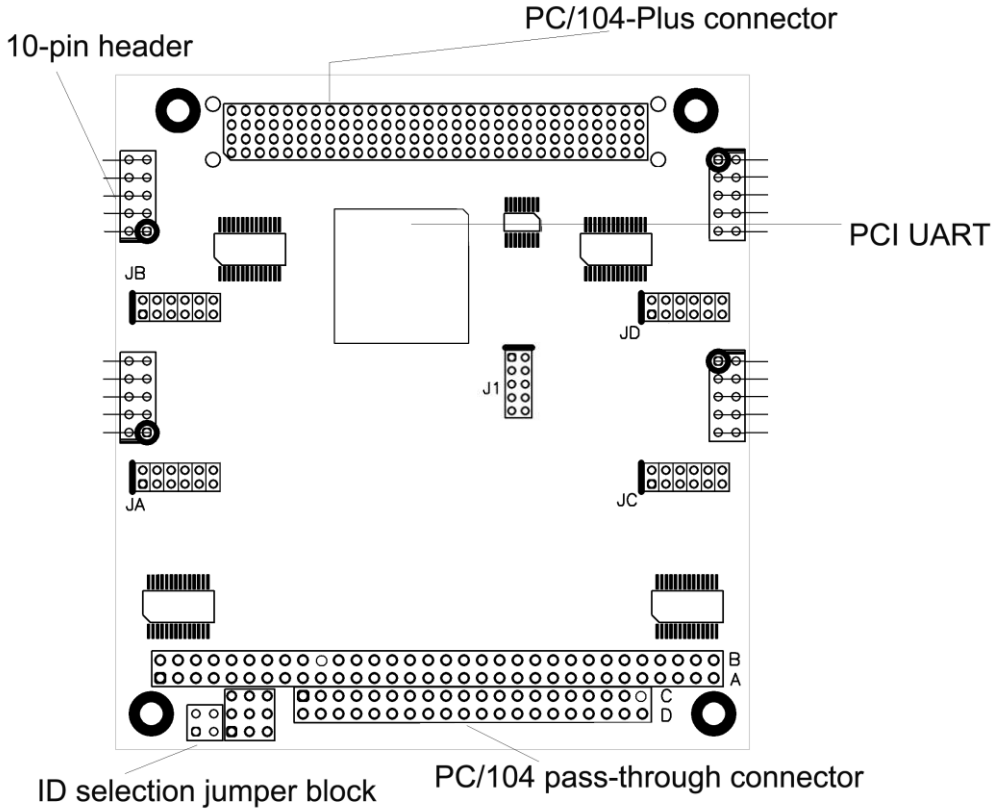


Figure 3: Xtreme/104-Plus RS-232/422/485/TTL Models



Note: Configuration information for the RS-232/422/485/TTL model, including jumper settings and pinouts, is located in Electrical Interfaces (RS-232/422/485/TTL models).

Figure 4: Xtreme/104-Plus Opto RS-232/422/485 Hardware Components (4 Port Model)

Xtreme/104 Express Diagrams

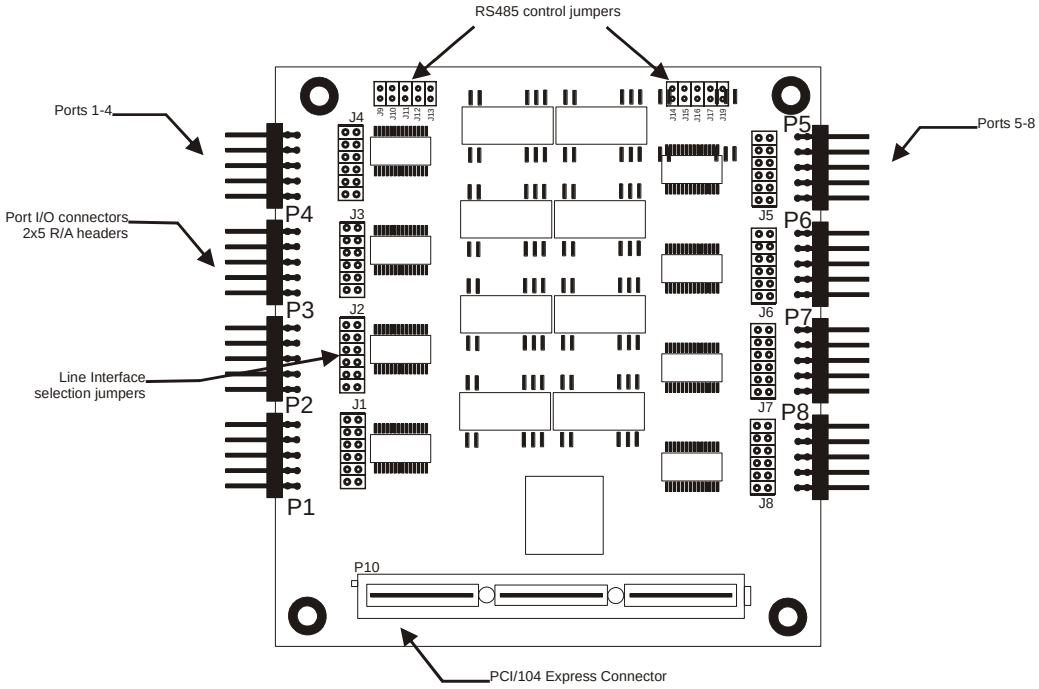


Figure 5: Xtreme/104-Express Opto Hardware Components

Xtreme/PCI104 12 Port Opto Diagrams

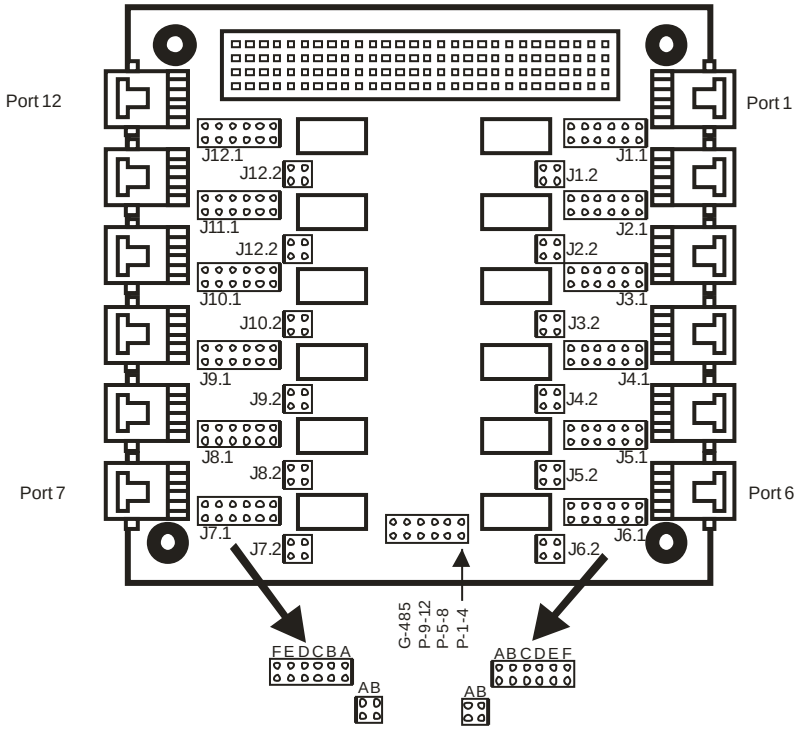


Figure 6: Xtreme/PCI104-Opto Hardware Components

Xtreme/104 Installation Overview

Before you begin, take a moment to ensure your package includes the components shipped with your product. These components should include:

- One Xtreme/104 adapter
- One CD containing software and documentation
- DB-9 male fan-out cable or DB9 male cables (optional)

If any of these components are missing, contact Connect Tech (see more Contact Details) or your reseller.

There are three stages to installing your Xtreme/104:

1. Hardware Configuration
   Interrupts and Memory selection will be set by the host computer's BIOS. This section outlines jumper settings and the ID selection process.

2. Hardware Installation
   Installation involves the physical connection of the Xtreme/104-*Plus* or Xtreme/104 Express within your computer's PC/104-***Plus*** stack. (Please note that you should configure any jumper settings, such as ID or electrical interface, if required, prior to installing the board.)

3. Software/driver installation
   Load the appropriate driver for your Operating System, as found on the accompanying CD. Installation guides are also available on the CD to aid you in this process.

Hardware Installation

Installing Xtreme/104-Plus or Xtreme/104PCI Cards Into Your System

Turn off the power to your system and open it to expose the PC/104 stack (consult your system's documentation for more information on this procedure).

Choose an available position in the PCIe/104 or PC/104-***Plus*** stack, and set the ID jumpers or rotary switch accordingly (see ID Selection). Insert the Xtreme/104-*Plus* or Xtreme/104 Express adapter and reassemble the stack.

Hardware Configuration

Interrupts and Memory Address Selection

Xtreme/104 boards are PCI cards, so the host computer's BIOS will automatically set interrupts and memory addresses when you reboot after installation.

Xtreme/104 Plus and Xtreme/PCI-104 ID Selection

Up to four Xtreme/104-***Plus*** boards can reside within a single PC/104-***Plus*** module stack. Each card within the stack must have a unique ID ranging from zero to three.

(this section does not apply to PCIe/104 cards)

Depending on the model of your Xtreme/104-***Plus*** adapter, you will be required to set either a pair of jumpers or a rotary switch to specify where your card is located within the stack. (Ensure that no two boards share an ID number.)

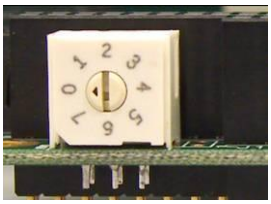
In systems designed prior to the PC/104-***Plus*** 2.0 specification, the fourth ID was reserved for target only devices and did not support bus mastering. Since the Xtreme/104-***Plus*** is not a bus mastering device, we would recommend an assignment of ID 3. This leaves three of the IDs in the PC/104-***Plus*** stack available for bus mastering devices.

In systems designed post PC/104-***Plus*** 2.0 specification, all four IDs support bus mastering, so there is no advantage to setting the Xtreme/104-***Plus*** ID to 3. Regardless of which PC/104-***Plus*** specification version the system is using, , the Xtreme/104-***Plus*** will work with any ID selected as long as no other device in the system is using the same ID.

Xtreme/104 Plus ID Selection Using the Rotary Switch

If your Xtreme/104-***Plus*** or Xtreme/104-***Plus*** Opto is equipped with a rotary switch, turn the knob on the switch so that the arrow points at the ID you would like to use. (See Figure 6 for the location of the rotary switch on the board). Use the following settings to set your adapter's location (or ID) within the stack:

Figure 7: Rotary Switch ID Selection



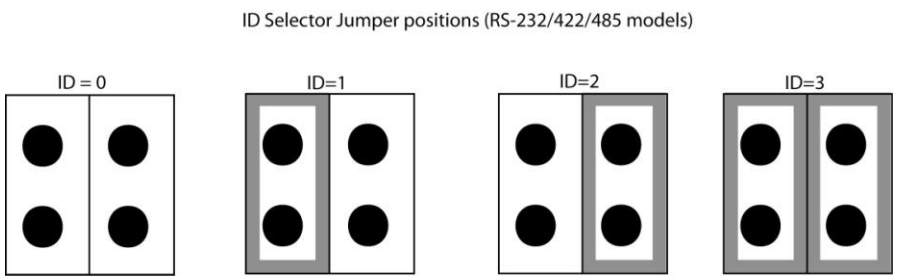
Module Slot	Switch Position
1	0 or 4
2	1 or 5
3	2 or 6
4	3 or 7

Xtreme/104 Plus and /PCI-104 ID Selection Using the Jumper Block

If your Xtreme/104-***Plus*** card is equipped with a jumper block for ID selection, set your board's location by changing jumper positions. Figure 7 depicts the jumper settings required for each ID.

The jumpers remain unpopulated for an ID of zero. Populate the left jumper for an ID of one, the right jumper for an ID of two or populate both for an ID of three.

Figure 8: Jumper Settings for ID Selection



Electrical Interfaces Xtreme/104 *Plus* and Express (RS-232/422/485 and RS-423 Models)

RS-232 Electrical Interface

This is the default setting for the interface selectable Xtreme/104-***Plus*** and Xtreme/104-***Plus*** Opto. To operate a port in RS-232 mode, no jumpers are set on the corresponding jumper block.

RS-422/485 Electrical Interface

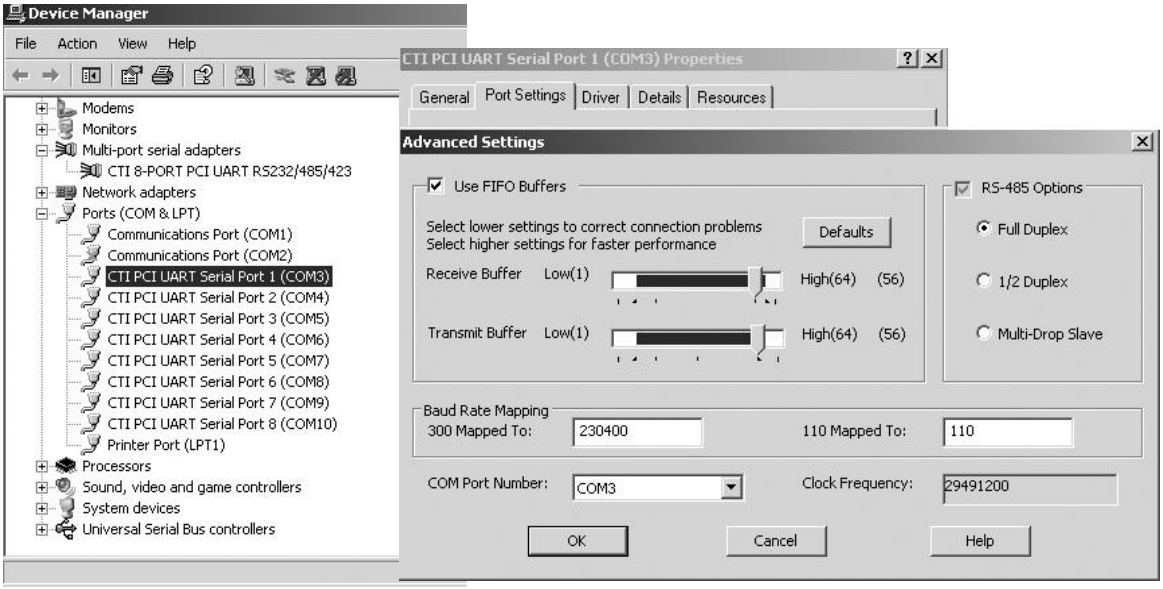
Xtreme/104 Express, Xtreme/104-***Plus and*** Xtreme/104-***Plus*** Opto RS-232/422/485 adapters support three modes of RS-422/485 communication, as outlined below. (See Figure 8 to see examples of jumper settings.)

Full Duplex 4-Wire Mode

In this mode, TxD+/- and RxD+/- are being driven to a known level all the time. This mode is typically used in point-to-point situations much like RS-232.

Half Duplex 2-Wire Mode

In Half Duplex mode the TxD+/- line driver is enabled only when data is transmitted, whereas, the RxD+/- is disabled when data is being transmitted. This mode is typically used in either point-to-point 2-wire connections or in multi-drop 2-wire bus connections. In the Windows Operating system, this mode requires software setup in **Control Panel – System – Hardware – Device Manager – Ports – CTI PCI UART**. Click on **Advanced** under **Port Settings** after the driver is installed.



Multi-drop 4-Wire Mode

In this mode the TxD+/- line driver is enabled only when data is transmitted and RxD+/- is enabled all of the time. This mode is typically used in multi-drop 4-wire connections. This mode requires software setup in **Control Panel – System Properties – Hardware - Device Manager – Ports – CTI PCI UART**. Click on **Advanced** under **Port Settings**. (See Half Duplex Mode).

Line Bias/Termination

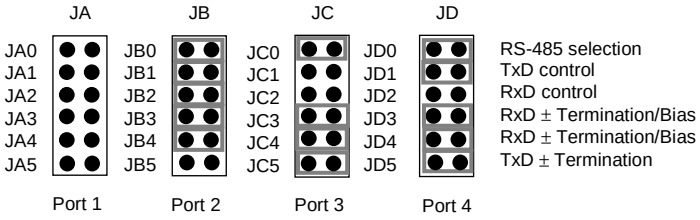
The RS-422/485 transceivers, both transmit and receive are optionally biased to produce a line level mark condition through jumper selectable resistors. These options are typically used in multi-drop 4-wire connections.

Jumper Block Settings

The following jumper block diagram depicts typical settings on a four-port selectable Xtreme/104-***Plus*** or Xtreme/104-***Plus*** Opto. Jumper blocks JA, JB, JC and JD control ports 1 through 4, respectively. The Xtreme/104 Express can have 4 or 8 ports which are controlled by J1 though J4, and J1 though J8 respectively.

Important Note!! We recommend that jumper removal and installation ***only*** *be performed when the power to the Xtreme card is off.*

Figure 9: Example of Various Jumper Block Settings for RS-232/422/485 Models



In this example, port 1 is set to RS-232, port 2 is set to RS-422/485 half duplex, port 3 is set to RS-422/485 full duplex, and port 4 is set to RS-422/485 multi-drop slave.

The following jumper blocks correspond to the following ports:

JA = J1 = Port 1	JE = J5 = Port 5
JB = J2 = Port 2	JF = J6 = Port 6
JC = J3 = Port 3	JG = J7 = Port 7
JD = J4 = Port 4	JH = J8 = Port 8

RS-485 Selection: Install this jumper to configure a port for RS-422/485 mode. If the jumper is not installed, the port will function in RS-232 mode.
TxD Control: Install this jumper to enable the RS-485 transmitter only when sending data. This mode is useful for half-duplex operation when only one device is allowed to send data at a time. If the jumper is not installed, the transmitter will always drive the line to an idle state when not sending data.
RxD Control: Install this jumper to enable the RS-485 receiver only when NOT transmitting data. This is useful for half-duplex operation to prevent the transmitting device from receiving its own data as it sends. If this jumper is not installed, the receiver is always enabled and ready to receive data.
RxD ± Termination/Bias: Install this pair of jumpers to enable a 150 ohm terminator across the RxD+ and RxD- pins for the corresponding port. A biasing network is also enabled that drives the receiver to an inactive or safe mode. The receiver can still receive data from another device and the biasing helps to prevent the reception of data generated by noise on the transmission line. The two jumpers for RxD termination/bias must be installed and removed as a pair.
TxD ± Termination: Install this jumper to enable a 150 ohm resistor across the TxD+ and TxD- pins of the corresponding port.

Important Port Numbering Note for Xtreme/104 *Plus* models:
Due to differences between the quad and octal UARTS, the port numbering for eight port models differs from the numbering for four port models.

Jumper blocks JA through JD control ports 1 through 4, respectively, on four port models.

On eight port models, jumper blocks JA through JD control the odd numbered ports and JE through JH control the even numbered ports, as follows:

JA = Port 1, JB = Port 3, JC = Port 5, JD = Port 7
JE = Port 2, JF = Port 4, JG = Port 6, JH = Port 8.

Note: this does not apply to Xtreme/104 Express models

Half Duplex and Multi-drop Slave modes require you to select the appropriate mode via software. Please refer to the **readme.txt** files found in the appropriate directories on the Xtreme/104-***Plus/Express*** CD.

Power-on Tri-state (Xtreme/104-*Plus* Opto and Xtreme/104 Express Opto models only): Xtreme/104- Opto models offer a power-on tri-state feature to ensure glitch-free power-up on multi-drop networks. When enabled, the Xtreme/104- Opto will hold the RS-485 transmitter in tri-state at power up. This feature is available on ports configured as RS-485 half duplex or RS-485 4-wire multi-drop.

Note: Enabling this feature on ports configured in RS-232 or RS-422 (RS-485 full duplex) modes will alter the operation of the RTS signal.

Jumper J1 (Xtreme/104 *Plus*) and J19 (Xtreme/104 Express) control the power-on tri-state functionality. Install a jumper on the first location of J1 or J19, and configure Port 1 in RS-485 half duplex or multi-drop slave in order to tri-state Port 1 at power-on; install a jumper on the second position of J1 to control Port 2, etc. Ports will not come out of tri-state until the driver has loaded and transmission begins on the associated port.

Though J1 is a five position jumper, only the first four have connections to the ports on the card. The fifth has no function.

Electrical Interfaces (RS-232/422/485/TTL Models)

RS-232/TTL Electrical Interface

The following control signals are available to ports configured for RS-232 and TTL mode: TxD, RxD, RTS, CTS, RI, DTR, DSR, DCD, SG (Signal Ground) and +5V. See Figure 3 for the location of Px1 RS-232/TTL port headers. See Figure 13 for information on configuring ports for RS-232 or TTL mode. (Note: Current draw on +5V pins of all ports must not exceed 1 Amp).

RS-422/485 Electrical Interface

In this mode, the port will communicate in RS-422 and RS-485 full duplex using the vertical Px2 headers. (See Figure 3 for the location of Px2 headers). The following control signals are available: $TxD_{+/-}$, $RxD_{+/-}$ and SR (Signal Reference). See Figure 13 for information on configuring ports for RS-422/485 mode.

Jumper Block Settings

The following jumper blocks correspond to the following ports:

JA = Port 1	JE = Port 5
JB = Port 2	JF = Port 6
JC = Port 3	JG = Port 7
JD = Port 4	JH = Port 8

The pin functions are outlined in the following diagram:

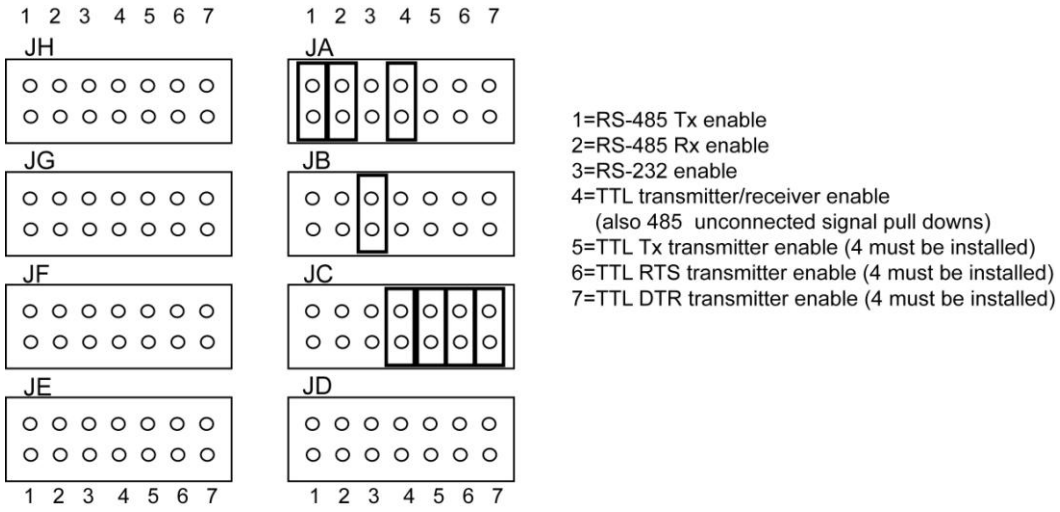


Figure 10: Examples of Various Jumper Block Settings for RS-232/422/485/TTL Models

In the example in Figure 2, port 1 (JA) is configured for RS-422/485 full duplex, port 2 (JB) is configured for RS-232, port 3 (JC) is configured for TTL, and ports 4 to 8 (JD to JH) are disabled.

When all jumpers are removed, the corresponding ports are completely disabled. The UART will receive no data from these ports, even if an external source is driving the headers.

Note: There are eight solder jumpers on the back of the board that correspond to the vertical (Px2) headers on the front of the board. (See Figure 3 for location of Px2 headers). If necessary, you can ensure $TxD_{+/-}$ pins on specified vertical headers remain active by shorting the appropriate jumper. This is possible even if the board is not in RS-422/485 mode or it is disabled.

Electrical Interfaces Xtreme/PCI-104 12 Port Opto

I/O Port Power for the Xtreme/PCI-104 Opto 12 Port

Jumpers J2A, J2B and J2C provide the ability to power on or off the I/O section of a port in groups of four. Removing the jumpers will remove power from the DC-DC converter and all components in the isolated section of the product.

This mode can be used in cases where power is in short supply and the group of ports is unused.

Jumper	Port bank Activated / Deactivated
J2A	Ports 1-4
J2B	Ports 5-8
J2C	Ports 9-12

The factory default is to have all three jumpers installed to enable all three banks of ports.

Note about Fusing: Each bank is protected by a resettable fuse from damage due to circuit failure or overload. To reset the fuse, the power should be removed for a minimum of one minute.

Line Modes

Low Power Shutdown: Mode (111)

This is the default mode when no mode configuration jumpers are installed. In this mode the SP336 line transceiver is shutdown and the I/O section port consumes a minimum of current. The current reduction is as much as 50ma for shutting down of a RS232 port and 70mA for shutting down a RS485 port.

RS-232 Electrical Interface: Mode (001)

To operate a port in RS-232 mode select mode 001.

Full Duplex 4-Wire RS485: Mode (101)

In this mode, TxD+/- and RxD+/- are being driven to a known level all the time. This mode is typically used in point-to-point situations much like RS-232, where long distances are required.

Multi-drop 4-WireRS485 Mode

In this mode the TxD+/- line driver is enabled only when data is transmitted and RxD+/- is enabled all of the time. This mode is typically used in multi-drop 4-wire connections.

This mode requires software setup in **Control Panel – System Properties – Hardware - Device Manager – Ports – CTI PCI UART**. Click on **Advanced** under **Port Settings**. (See Half Duplex Mode).

Half Duplex 2-Wire RS485: Mode (100)

In Half Duplex mode the TxD+/- line driver is enabled only when data is transmitted, whereas, the RxD+/- is disabled when data is being transmitted. This mode is typically used in either point-to-point 2-wire connections or in multi-drop 2-wire bus connections.

In the Windows Operating system, this mode requires software setup in **Control Panel – System – Hardware – Device Manager – Ports – CTI PCI UART**. Click on **Advanced** under **Port Settings** after the driver is installed.

Line Bias/Termination

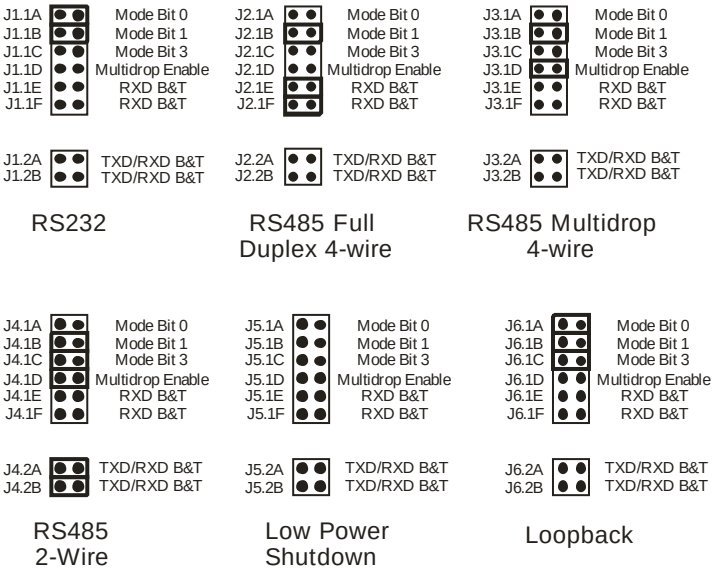
The RS-422/485 transceivers, both transmit and receive are optionally biased and terminated to produce a stable idle condition through jumper selectable resistors.

Jumper Block and Mode Settings for 12 Port Opto

The following jumper block diagram depicts typical settings on a four-port selectable Xtreme/PCI-104 12 Port Opto. Each port has two banks of jumper blocks, Jx.1y and Jx.2y. Where 'x' is the port number and 'y' is the jumper number of that power.

*Important Note!! We recommend that jumper removal and installation **only** be performed when the power to the Xtreme/104 card is off.*

Figure 11: Examples of Various Jumper Block Settings for the 12 Port Opto model



Bias and Termination Resistors

The (B&T) Bias and Termination resistors are use in RS485 communications. All other modes these jumpers should be removed.

The B&T resistors are selected using jumpers Jx.1E/Jx.1F and Jx.2A/Jx.2B.

RXD and TXD/RXD Termination/Bias: Install this **pair of jumpers** to enable a 150 ohm terminator across the RxD+ and RxD- or TxD+ and TxD- pins for the corresponding port. A biasing network is also enabled that drives the receiver to an inactive or safe mode. The receiver can still receive data from another device and the biasing helps to prevent the reception of data generated by noise on the transmission line. The two jumpers for the termination/bias **must be installed and removed as a pair**.

Bias and Termination Notes:

- For 2-wire and 4-wire multidrop wiring networks the B&T resistors are only installed when the Xtreme/PCI-104 12 Port Opto is the first or last device in the wiring network.

- For 2-wire networks only the Jx.2A/Jx.2B jumpers should be installed. The Jx.1E/Jx.1F jumpers are not used and will have no effect.

Line Interface Mode Jumpers for Xtreme/PCI-104 Opto 12 Port

The Line Interface Mode Jumpers function is as follows:

Mode / Jumpers	Jx..1A	Jx..1B	Jx..1C
Loopback	0	0	0
RS232	0	0	1
RS485 4-wire / Multidrop	1	0	1
RS485 2-wire	1	0	0
Low Power Shutdown	1	1	1
DO NOT USE ANY OTHER COMBINATIONS THAN THE ABOVE			

Power-on Tri-state for Xtreme/PCI-104 Opto 12 Port

These models offer a power-on tri-state feature to ensure glitch-free power-up on multi-drop networks. When enabled, the Xtreme/104- Opto will hold the RS-485 transmitter in tri-state at power up. This feature is available on ports configured as RS-485 half duplex or RS-485 4-wire multi-drop.

Note: Enabling this feature on ports configured in RS-232 or RS-422 (RS-485 full duplex) modes will alter the operation of the RTS signal.

Jumper **G-485** in J2 controls the power-on tri-state functionality. Install a jumper on this jumper to enable the Power on Tri-State function..

Software Configuration

Depending on the Line Mode you require, the Xtreme/PCI-104 will require some special configuration in the driver software as follows:

- RS232 Mode – No special configuration
- RS422/485 4-wire Mode –No special configuration
- RS485 4-wire multidrop Mode – The RS485 multidrop mode must be enabled. In our driver software this is sometimes referred to as Multidrop Slave mode.
- RS485 2-wire (half duplex) Mode – The 2-wire or half duplex mode must be set enabled.

Each driver for a given operating system will have different methods of enabling these modes of operation.

For example under the Windows Operating system these settings can be found in the **Device Manager-> Ports** properties area.

Please see the release notes or readme files included with each driver for instructions. Further details can be found on the Connect Tech Web site at www.connecttech.com/ in the Support Centre area.

Connectors/Pinouts

Xtreme/104 Plus

Figure 12: 40 Pin Connector: Pin Numbering

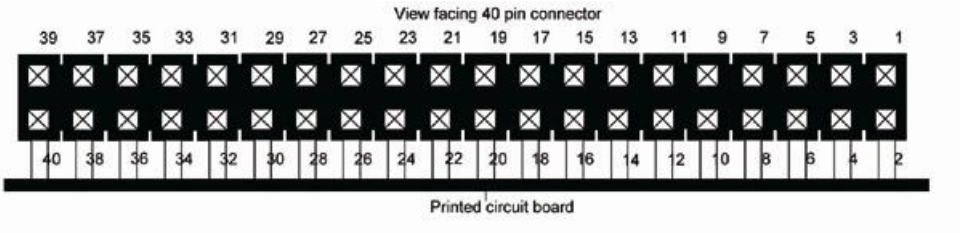


Table 1: I/O Signal Assignments for RS-423 Models

Header Port Number	Header Pin Number	RS-423	Direction
1	**1**	RxD+	Input
	2	CTS-	Input
	3	RxD-	Input
	4	RTSRef (RTS+)	Signal Reference
	5	TxDRef (TxD+)	Signal Reference
	6	CTS+	Input
	7	TxD-	Output
	8	RTS-	Output
	9	GND	Ground **[1]**
	10	N/C	No connection
2	**11**	RxD+	Input
	12	CTS-	Input
	13	RxD-	Input
	14	RTSRef (RTS+)	Signal Reference
	15	TxDRef (TxD+)	Signal Reference
	16	CTS+	Input
	17	TxD-	Output
	18	RTS-	Output
	19	GND	Ground **[1]**
	20	N/C	No connection
3	**21**	RxD+	Input
	22	CTS-	Input
	23	RxD-	Input
	24	RTSRef (RTS+)	Signal Reference
	25	TxDRef (TxD+)	Signal Reference
	26	CTS+	Input
	27	TxD-	Output
	28	RTS-	Output
	29	GND	Ground **[1]**
	30	N/C	No connection
4	**31**	RxD+	Input
	32	CTS-	Input
	33	RxD-	Input
	34	RTSRef (RTS+)	Signal Reference
	35	TxDRef (TxD+)	Signal Reference
	36	CTS+	Input
	37	TxD-	Output
	38	RTS-	Output
	39	GND	Ground **[1]**
	40	N/C	No connection

Note: [1] 47Ω to GND. Ground is connected to the DC ground by a 47Ω resistor to reduce ground loop current.

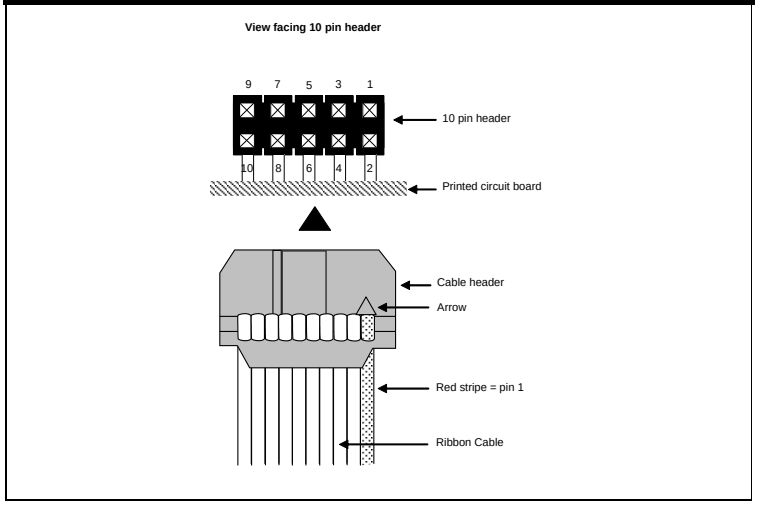
Table 2: I/O Signal Assignments for RS-232/422/485 Models (See Figure 1 for Port Numbering)

Header Port No. (4 port models)	Header Port No. (8 port models)	Pin No.	RS-232	Direction	RS-422/485	Direction
1	1 or 2	1	DCD	Input	RxD+	Input
		2	DSR	Input	CTS-	Input
		3	RxD	Input	RxD-	Input
		4	RTS	Output	RTS+	Output
		5	TxD	Output	TxD+	Output
		6	CTS	Input	CTS+	Input
		7	DTR	Output	TxD-	Output
		8	RI	Input	RTS-	Output
		9	SG	Signal Ground	SR	Signal Reference
		10	N/C	No Connection	N/C	No Connection
2	3 or 4	11	DCD	Input	RxD+	Input
		12	DSR	Input	CTS-	Input
		13	RxD	Input	RxD-	Input
		14	RTS	Output	RTS+	Output
		15	TxD	Output	TxD+	Output
		16	CTS	Input	CTS+	Input
		17	DTR	Output	TxD-	Output
		18	RI	Input	RTS-	Output
		19	SG	Signal Ground	SR	Signal Reference
		20	N/C	No Connection	N/C	No Connection
3	5 or 6	21	DCD	Input	RxD+	Input
		22	DSR	Input	CTS-	Input
		23	RxD	Input	RxD-	Input
		24	RTS	Output	RTS+	Output
		25	TxD	Output	TxD+	Output
		26	CTS	Input	CTS+	Input
		27	DTR	Output	TxD-	Output
		28	RI	Input	RTS-	Output
		29	SG	Signal Ground	SR	Signal Reference
		30	N/C	No Connection	N/C	No Connection
4	7 or 8	31	DCD	Input	RxD+	Input
		32	DSR	Input	CTS-	Input
		33	RxD	Input	RxD-	Input
		34	RTS	Output	RTS+	Output
		35	TxD	Output	TxD+	Output
		36	CTS	Input	CTS+	Input
		37	DTR	Output	TxD-	Output
		38	RI	Input	RTS-	Output
		39	SG	Signal Ground	SR	Signal Reference
		40	N/C	No Connection	N/C	No Connection

Xtreme/104 Plus Opto 4&8 Port

Table 3: 10 Pin R/A Port Header Pinouts on Opto Models

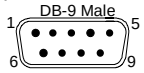
Pin No.	RS-232	Direction	Direction	Direction
1	NC	NC	RxD (+)	input
2	NC	NC	CTS (-)	input
3	RxD	input	RxD (-)	input
4	RTS	output	RTS (+)	output
5	TxD	output	TxD (+)	output
6	CTS	input	CTS (+)	input
7	NC	NC	TxD (-)	output
8	NC	NC	RTS (-)	output
9	isolated gnd.	signal gnd.	isolated gnd.	signal reference
10	N/A	N/A	N/A	N/A



Note: The red stripe on the CAG104 cable indicates pin 1 on the 10 pin cable header connector.

Table 4: DB-9 Male Fan-out Cable Pinouts

Pin #	RS-232		RS-422/485		RS-423 [1]	
DB-9	Signal	Direction	Signal	Direction	Signal	Direction
1	DCD	Input	RxD+	Input	RxD+	Input
2	RxD	Input	RxD-	Input	RxD-	Input
3	TxD	Output	TxD+	Output	TxDRef (TxD+)	Signal Reference
4	DTR	Output	TxD-	Output	TxD-	Output
5	SG	Signal Ground	SR	Signal Reference	GND	Ground **[2]**
6	DSR	Input	CTS-	Input	CTS-	Input
7	RTS	Output	RTS+	Output	RTSRef (RTS+)	Signal Reference
8	CTS	Input	CTS+	Input	CTS+	Input
9	RI	Input	RTS-	Output	RTS-	Output

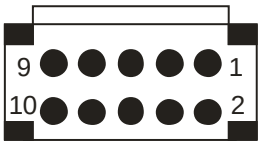


Notes:
[1] When CAG8104 cable assembly is attached.
[2] 47Ω to GND. Ground is connected to the DC ground by a 47Ω resistor to reduce ground loop current

Xtreme/PCI-104 12 Port Opto

Table 5: 10 Pin R/A Port Header Pinouts on 12 Port Opto Models

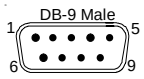
Pin No.	RS-232	Direction	RS422/485 4-wire	Direction	RS485 2-Wire (Half Duplex)	Direction
1	NC	NC	RxD (-)	input	NC	NC
2	RXD	input	RxD (+)	input	NC	NC
3	RTS	output	RTS (+)	output	NC	NC
4	NC	NC	RTS (-)	output	NC	NC
5	TXD	output	TxD (+)	output	TxD/RxD+	input/output
6	NC	NC	TxD (-)	output	TxD/RxD-	input/output
7	NC	NC	CTS (-)	input	NC	NC
8	CTS	input	CTS (+)	input	NC	NC
9 *	GND / SR	GND / SR	GND / SR	GND / SR	GND / SR	GND / SR
10 *	GND / SR	GND / SR	GND / SR	GND / SR	GND / SR	GND / SR



* SR means Signal Reference. This is terminology used in RS485 communications.
NC means No Connect. Please avoid connecting to these pins.

Table 6: CBG067 DB-9 Male Cable Pinouts for 12 Port Opto model

Pin # DB-9	RS-232 Signal	RS-232 Direction	RS-422/485 Signal	RS-422/485 Direction	RS-485 2-wire (Half Duplex) Signal	RS-485 2-wire (Half Duplex) Direction
1	NC		RX-	Input	NA	Input
2	RX		RX+	Input	NA	Input
3	TX	Output	TX+	Output	TXRX+	Signal Reference
4	NC	Output	TX-	Output	TXRX-	Output
5	GND / SR	GND / SR	GND / SR	GND / SR	GND / SR	GND / SR
6	NC		RTS-	Input	NA	Input
7	RTS	Output	RTS+	Output	NA	Signal Reference
8	CTS		CTS+	Input	NA	Input
9	NC		CTS-	Output	NA	Output



Xtreme/104 Plus RS232/485/TTL model

Table 7: RS-232/TTL Px1 Right Angled Header Pinouts (CAG104 Compatible)

(See Figure 3 for port numbering and locations)

Pin #	RS-232/TTL Signal	Direction
1	DCD	Input
2	DSR	Input
3	RxD	Input
4	RTS	Output
5	TxD	Output
6	CTS	Input
7	DTR	Output
8	RI	Input
9	SG	Signal Ground
10	+5V	supply to external devices

Note: Total current drawn on +5V pins of all ports must not exceed 1A.

Table 8: RS-485 Px2 Vertical Header Pinouts

(See Figure 3 for port header numbering and locations)

Pin #	RS-485 Signal	Direction
1	TxD+	Output
2	TxD-	Output
3	RxD+	Input
4	RxD-	Input
5	SR	Signal Reference

Table 9: Multipurpose I/O (MPIO) Header Pinout (Direct Connection to UART)

(See Figure 3 for location of MPIO header and pin numbering)

Pin #	Signal
1	MPIO1
2	MPIO2
3	MPIO3
4	MPIO4
5	MPIO5
6	MPIO6
7	MPIO7
8	MPIO8
9	GND
10	GND

Wiring Examples

RS232 Wiring Example

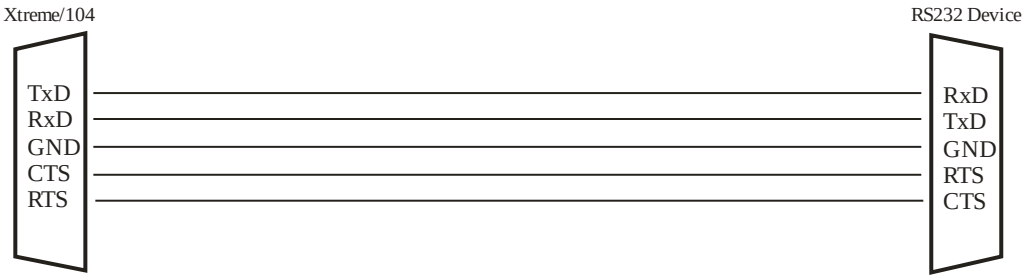


Figure 13: RS-232 Wiring Diagram

RS423 Wiring Example

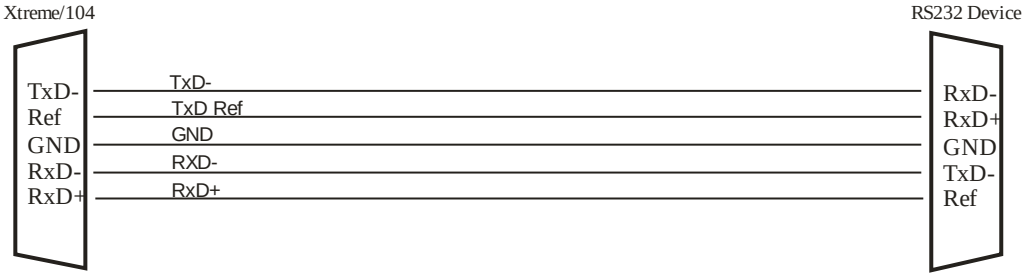


Figure 14: RS-423 Wiring Diagram

RS-422/485 Wiring Examples

Note: The RS-422/485 electrical interface consists of a differential signaling scheme. You should always connect the signals with twisted pairs. The Signal Reference (GND) must be connected.

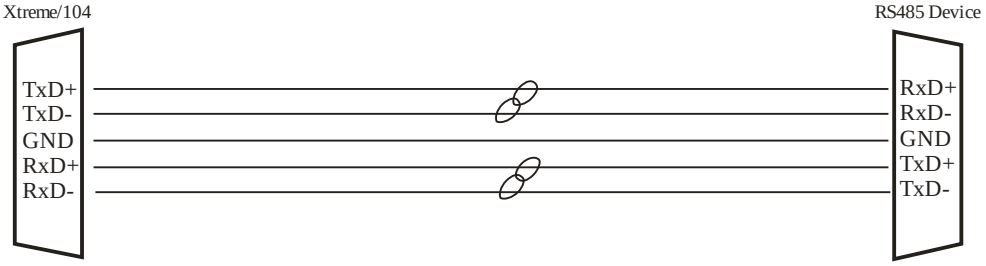


Figure 15: RS-422/485 Wiring Diagram (4 Wire)

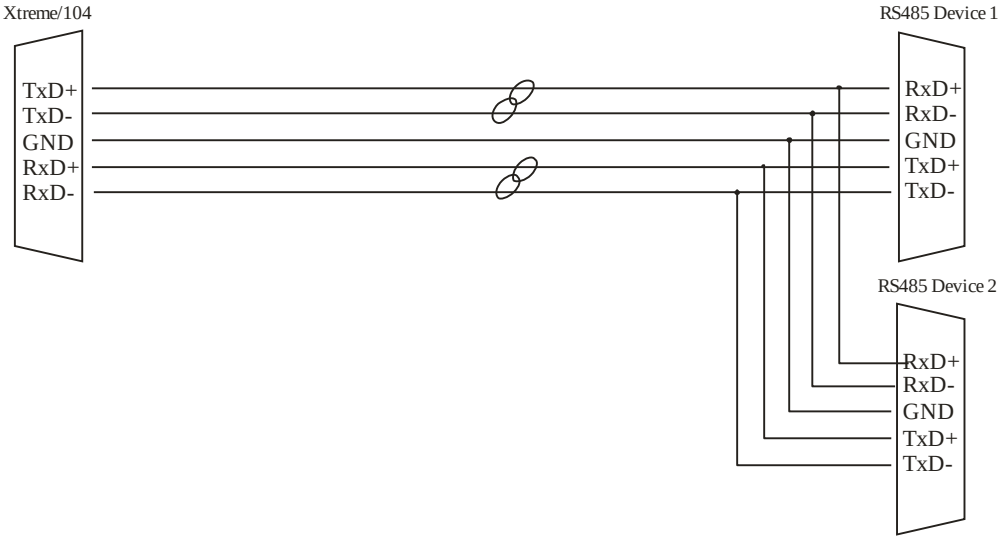
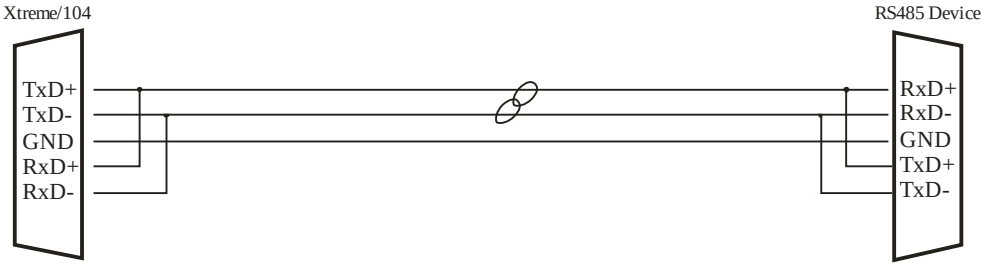


Figure 16: RS-422/485 Wiring Diagram (4 Wire Multidrop)



Note: On the Xtreme/PCI-104 12 Port Opto the TxD+ to RxD+ and TxD- to RxD- wiring is done by the SP336 transceiver when Half Duplex mode is configured.

Figure 17: RS-422/485 Wiring Diagram (2 Wire)

Software Installation

Xtreme/104-***Plus,*** Xtreme/104 Express and Xtreme/PCI-104 products include support for the following operating systems:

- Windows NT/2000/Server /XP/Vista/Seven
- Windows CE (Not all models supported, contact support for most recent product support)
- Windows XPe (Not all models supported, contact support for most recent product support)
- QNX 4
- QNX 6
- Linux

Please refer to the **readme.txt** files found in the appropriate directories on the Xtreme/104-***Plus*** CD containing drivers and documentation. These files contain technical tips or release notes concerning installation and configuration of the device driver. For further information concerning software installation of Xtreme/104 products please visit the Connect Tech website at www.connecttech.com/

If you are interested in a device driver for an operating system not listed please contact the Connect Tech Sales Department. Also, visit the Download Zone of the Support Center on the Connect Tech website for the latest product manuals, installation guides, diagnostic utilities and device driver software

Specifications

Operating Environment

Storage temperature: -40° C to 125° C

- Operating temperature:
  - 0° C to 70° C (Commercial temperature models)
  - -40° C to 85° C (Industrial temperature models)
- Humidity: 95% non-condensing

Power Requirements

Xtreme/104-*Plus* RS-423 models
+5 V DC +/-5% @ 100 mA (max.) 2 port models
Xtreme/104-*Plus* RS-232/422/485 models
+5 V DC +/-5% @ 385 mA (max.) 4 port models
+5 V DC +/-5% @ 575 mA (max.) 8 port models
Xtreme/104-*Plus* RS-232/422/485/TTL models
+5 V DC +/-5% @ 575 mA (max.) 8 port models
Xtreme/104-*Plus* Opto RS-232/422/485 models
+5 V DC +/-5% @ 500 mA (max.) 2 and 4 port models
Xtreme/104-Express Opto 8 Port models
+5 V DC +/-5% @ 1100 mA (max.)
Xtreme/104-Express Opto 4 Port models
+5 V DC +/-5% @ 700 mA (max.)
Xtreme/PCI-104 12 Port Opto 4 model
+5 V DC +/-5% @ 980 mA (all ports RS485 mode)
+5 V DC +/-5% @ 830 mA (all ports RS232 mode)

PC/104 Bus Interface

3.3V or 5V PC/104-***Plus*** or PCI-104

PCIe/104 Bus Interface

PCIe/104 Express interface. Or PCI/104 Express interface when PCI/104 stack through is not required.

PCI-104

The Xtreme/PCI-104 12 Port Opto requires a 5V PCI Power, but is compatible with 3.3V and 5V PCI signalling.

Dimensions

PC/104-***Plus*** or PCIe/104 or PCI/104 Express compliant.

Communications

Baud Rates

RS-232/TTL:	**PC/104 *Plus*** Models: 50 bps – 921.6 Kbps
	PCI/104 Express models: Any standard baud rate up to 921.6Kbps +/-1.5% *
RS-422/485:	**PC/104 *Plus*** Models: 50 bps – 1.8432 Mbps
	PCI/104 Express models: Any standard baud rate up to 7.812Mbps +/-1.5% *
RS-423:	50 bps – 115.2 Kbps

** +/- 1.5 is the worst case baud rate error. Typical baud rates are less than 0.1%. Typical baud rates are for example: 1200, 9600, 38400, 57600, 115200, 230400, 921600.*

UARTs

Dual, quad or octal Exar PCI UARTs provide 64 byte transmit and receive FIFO buffers for each port.

Quad or Octal Exar PCI Express UARTs provide 256 byte transmit and receive FIFO buffers for each port.

Control Signals

Xtreme/104-Plus RS-423 Models
RS-423: TxD-, TxDRef, RxD+/-, RTS-, RTSRef and CTS+/-
Xtreme/104-Plus RS-232/422/485 Models
RS-232: TxD, RxD, RTS, CTS, RI, DTR, DSR, DCD and Signal Ground (SG)
RS-422/485: TxD+/-, RxD+/-, RTS+/-, CTS+/- and Signal Reference (SR)
Xtreme/104-Plus RS-232/422/485/TTL Models
RS-232/TTL: TxD, RxD, RTS, CTS, RI, DTR, DSR, DCD, Signal Ground (SG) and +5V
RS-422/485: TxD+/-, RxD+/- and Signal Reference (SR)
Xtreme/104-Plus Opto and Xtreme/104 Express Opto RS-232/422/485 Models
RS-232: TxD, RxD, RTS, CTS and Signal Ground (SG)
RS-422/485: TxD+/-, RxD+/-, RTS+/-, CTS+/- and Signal Reference (SR)

Certification

The Xtreme/104-***Plus*** and Express product families are to be included into a device ultimately subject to FCC, DOC/IC, and CE certification. The customer is responsible for bringing the completed device into compliance prior to resale. Connect Tech Inc. has designed the Xtreme/104-***Plus*** and Express families with EMI and EMC considerations in mind such as:

- Ground and power planes
- EMI/EMC reducing PCB layout
- Filtering on I/O signals